



## ***Maestro***

Long-range Wireless Transmission System

M52 User's Manual V1.1 2020.07

**Introduction / Installation Guide / Instruction**

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# Disclaimer

- Please read the user's manual carefully before use. Be sure to pay attention to the warnings and understand all points completely.
- Please strictly abide by the local radio frequency management regulations.
- Please follow the installation steps in the manual to use this product. Our company and agent will not take legal responsibility for the damage of equipment or personnel caused by the installation and modification of users.
- This copyright of this manual belongs to Shenzhen Mainlink Aero Communication Technology Co., LTD. No one may make copies without written consent.

# Caution

## Attention to installation

1. Before power on, make sure the antenna connection is reliably . Otherwise, it will cause damage to the device.
2. Make sure that the voltage is within the range of use.
3. Please pay attention to the EMC of all the electronic equipments on your drone.
4. It is recommended that the antenna should be installed downward and keep the antenna away from the metal on the drone.
5. Make sure to use the matching antenna.

## Before use

1. Make sure that all cables are connected correctly and firmly.
2. No foreign objects (e.g. liquids, sand, etc.) can be entered inside the device.

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3. It takes 15 seconds for the device to start. Video and data cannot be transferred until the device has finished booting.

4. Please ensure that the environment in which the equipment is used is free of other electromagnetic interference.

5. When the signal weakens, you can improve the effect by changing the heading direction of the antenna.

## Get instructional video

In order to use the system correctly, you can get the instructional Video at the following address:

<https://mainlinkaero.com/cn/video/video-main.html>



## Download Maestro Assistant

Download the software at the following address:

<https://mainlinkaero.com/cn/download/download-main.html>



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# Packing list

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**Device X 2**

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## Accessories

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**2Pin XT30 cable X 2**



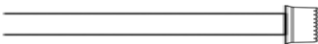
For Power

**3Pin cable X 6**



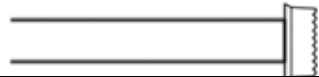
For UART and SBUS

**4Pin cable X 2**



For Ethernet

**7Pin cable X 2**



For Ethernet and Power\_Out

**Antenna X 2**



For air unit

**Fiber-glass antenna X 2**



For ground unit

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# Overview

Industry drone market is developing very fast in recent years. The flight time and distance of drones are getting longer and longer. M52, a long-range wireless transmission system, is designed for VTOL fixed wing and other long-range drones. The system can transmit video, flight control data, gimbal control data, and RC data simultaneously. With the advantage of high level integration and powerful function, M52 is a typical good product to meet long-range transmission requirements.

There are three ethernet ports in M52. Users can connect it to ethernet gimbal and other payload simultaneously. If you want to connect HDMI/SDI/AV port payload, we have MF05、MF08 to meet your needs. You only need one single switching cable to connect M52 and MF05. And the switching cable is in the accessory box. For more information, please refer to the relevant section below. There are two UART port——UART1 and UART2. Two protocols, Mavlink and Transparent, are supported. Users can make changes easily through Maestro Assistant or Webpage. There are two SBUS——SBUS\_IN and SBUS\_OUT for RC data transmission,

There are two frequency bands——800MHz and 1.4GHz. Users can choose according to their needs. Please choose the suitable frequency band according to local regulations.

The weight of M52 is 143g, making it very suitable for long-range drones. With advanced radio frequency and encryption technology, M52 can achieve long distance secure transmission. The maximum transmission distance of M52 can reach 34km<sup>\*1</sup>.

We are going to open up the SDK in M52 platform. Users can easily complete secondary development. For more information of SDK, please look up on our official website. The software SDK and examples will be continuously updated.

<sup>\*1</sup>Test under LOS and no interference conditions.

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# Features

## Long distance

- Up to 34km @ LOS

## Video interface

- Ethernet \*3

## Hopping/Fixed Frequency

- Fixed: user defined
- Hopping: automatic

## BW

- 3/5/10/20 MHz

## Work temperature

- 40°C ~ +70°C

## Modulation

- OFDM

## Data interface

- UART (TTL/RS232) /SBUS,

## Frequency Band

- 800MHz/1.4GHz

## Working mode

- Air unit can be : Point to point mode  
Repeater mode

## Power range

- DC 9~28V Battery 3S~6S



# M52 Interface Description



side view

## 1. Power indicator

This indicator is solid green when air unit is booting.

## 2. Link indicator

LED Pattern	Description
solid green	Wireless link is established
light off	Wireless link is lost

## 3. Status Indicator

LED Pattern (Blink only in booting)	Description
Blink 2 times	Initialization OK, Frequency is 1.4G
Blink 1 time	Initialization OK, Frequency is 800M
Blink 3 times	Switch mode (Switch from air to ground, vice verse)
Blink slow all the time	Enter configuration mode
Blink fast all the time	Device abnormal

## 4. RSSI Indicator

LED Pattern	Description
3 solid green	Wireless signal is strong
2 solid green	Wireless signal is medium



3	S	SBUS_OUT	O
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#### 11. SBUS IN

Number	Character	Description	Input/Output
1	G	GND	I/O
2	V	+5V Output (Maximum current 1A)	O
3	S	SBUS_IN	I

#### 12. UART2

Number	Character	Description	Input/Output
1	G	GND	I/O
2	R	RXD (from external to M52)	I
3	T	TXD (from M52 to external)	O

#### 13. UART1

Number	Character	Description	Input/Output
1	G	GND	I/O
2	R	RXD (from external to M52)	I
3	T	TXD (from M52 to external)	O

#### 14. Mode switch

The switch in the side of "A" means "air" and in the side of "G" means "ground" .



**Attention: When two M52 devices can not link, please check the Mode switch**

**first.**

#### 15. Button

Press for 10 seconds, air unit will restore all parameters to factory setting.

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# Installation

## Air

### 1. Installing the air unit on your drone

Fixed the device and RF cable on your drone. Install the antenna. Pay attention to the connection of the antenna to tighten. Make the antenna downward. There is no metal or shielding within 20cm of the antenna.



### 2. Connecting the gimbal

Connect the gimbal to one ethernet of M52. Connect UART1 to flight control. If you need to control the drone with RC, please connect SBUS\_OUT of M52 to flight control SBUS IN.



Attention: If your gimbal only has HDMI/SDI/AV interface, please refer to the section of “M52 with M05E” . When using the SBUS, please pay more attention to the power.

Do not put the antenna near the motor or ESC, otherwise the device will be interfered.

## Ground

### 1.Connect the antenna

Connect the fiber glass antenna which was supplied along with the device to the ground unit. They have common port—SMA. Make sure to tighten the joint. The 2 fiber glass antenna

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should be 1.5m apart.



Connect the RC receiver and other cables.

Connect the RC receiver SBUS output to the ground unit SBUS\_IN and then connect the power cable.

## 2. Connect to the Ground Station

The M52 ground unit can be connected to the Ground Station with ethernet or UART.

### **Get Video**

You can get video via RTSP, and decode the video with video decoding software such as VLC. Also, you can get video using Mission Planner and QGC.

### **Get data**

1. You can get data from ground unit via UART1 and UART2. Maybe you need a UART to USB converter.

2. You can get data from Ethernet port using UDP/TCP protocol.

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# M52 Instruction

## Quick start

### 1. Preparing

Make sure all the connections are ready, including the antenna, Ethernet cable and so on. If you connect a ethernet gimbal to M52 air unit, the GH1.25 interface is recommended for high reliability.

### 2. Power on

The DC voltage is 9~28V. After power on, the POWER LED will be solid green.

Any question, please refer to the FAQ. It takes 15 seconds to start up. After the system starts, the wireless transmission can be established.

### 3. Using PC to get video from ethernet gimbal.



3.1 Connect gimbal、M52 and PC as shown above.

**Attention:** Please ensure that gimbal and PC on the same network segment. The default IP of M52 is in the table below. The network segment of gimbal and M52 can be the same or different. M52 can transmit video and data transparent.



M52 air unit default IP	192.168.1.200
M52 ground unit default IP	192.168.1.236

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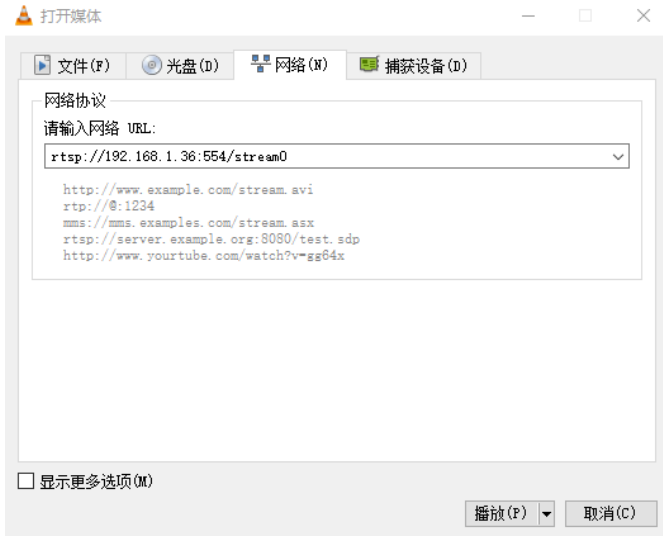
### 3.2 Get video

User can get video in PC through the software provided by the gimbal manufacturer. Also, user can use some common software such as VLC.

Take VLC for an example.

In the “open media” page, please input the following address:

rtsp://192.168.1.36:554/stream0

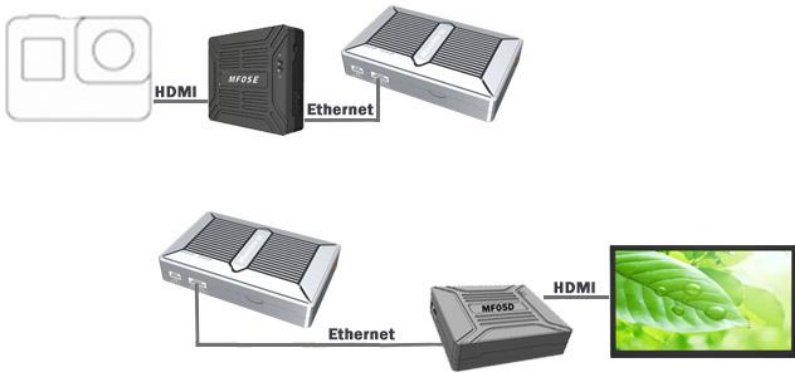


You can get video after click “play” .

## M52 with CODEC module MF05

If your gimbal has a HDMI/SDI/AV interface, you can add CODEC module MF05 to work with M52. MF05 contains encoding module MF05E and decoding module MF05D. You only need one single cable in the accessory box to connect M52 and MF05. It is shown in the picture below.

For more information, please refer to the MF05 user's manual.



## M52 with Mission Planner

Follow the steps to use M52 with Mission Planner:

1. Connect the UART1 of M52 air unit to flight controller, such as Pixhawk. Connect the gimbal to one ethernet of M52.
2. Making sure all the air and ground cable connection is finished. Power on the system.
3. Install Mission Planner to your computer.
4. Set the IP address of the computer.

Open "Network and Internet" setting.

Select "Internet Protocol version 4 (TCP / IPv4) properties".

Change IP address to "192.168.1.xxx" (xxx is in 0 ~ 255 , you can't use IP 192.168.1.200 and 192.168.1.236, because these IP were set in M52) .

**⚠ Attention: The IP "192.168.1.XXX" is just an example. You need to set up your PC the same IP section as your gimbal.**



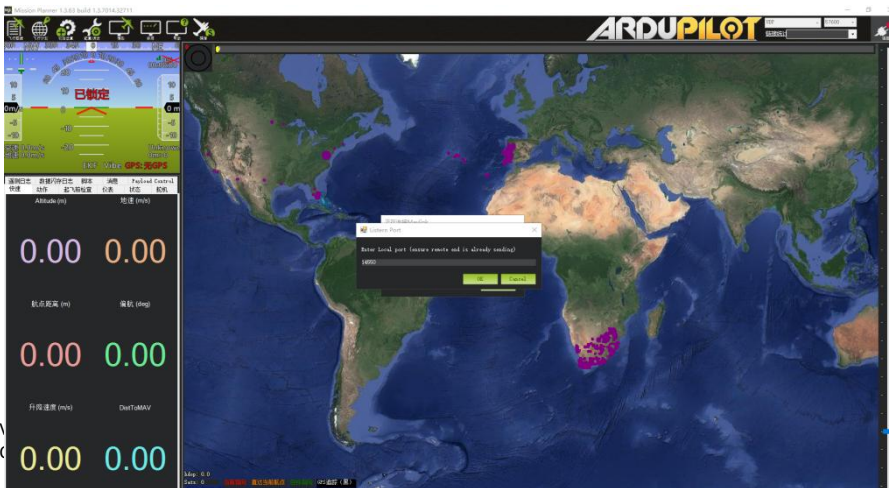


## 5. Get data

There are three methods to get data from M52 ground unit, using Mission Planner:

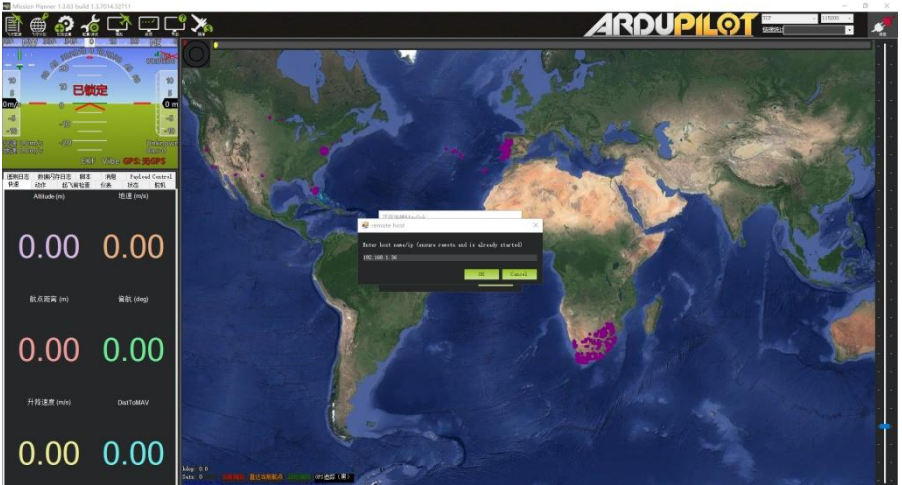
- UDP port via Ethernet;
- TCP port via Ethernet;
- UART (COM)


### 5.1 Get data from UDP port.



Open Mission Planner, select UDP, click the “connect” button, it will bring up a new window ‘Listen port’, change the port to 14550 (If the UDP port number has been changed on the web page, please fill in the new number. For more information, please go to the web page configuration) .Then click “OK”, Mission Planner will get flight data.

### 5.2 Get data from TCP port.

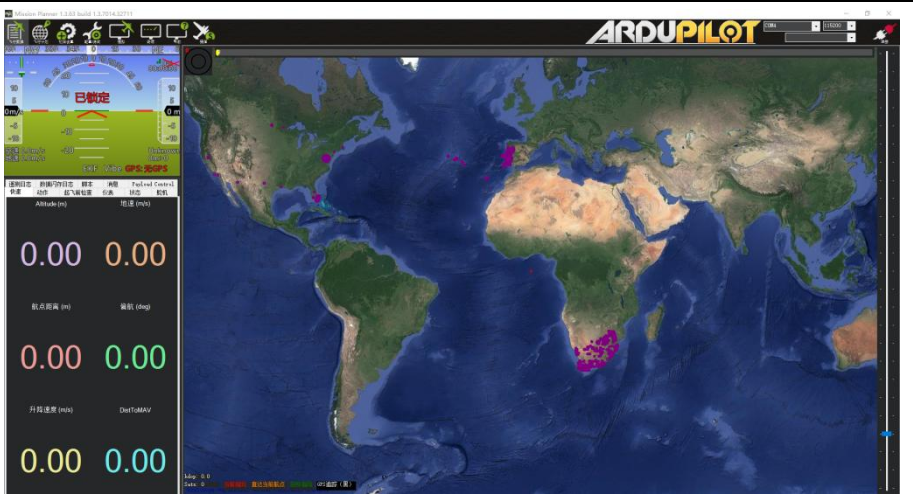


Open Mission Planner, select TCP, click the “connect” button, it will bring up a new window ‘Listen port’, fill in the blank with IP: 192.168.1.236, remote port is 5760  (If the IP address and TCP port number has been changed on the web page, please fill in the new IP and port number. For more information, please go to the web page configuration) .Then click “OK”, Mission Planner will get flight data.

### 5.3 Get data from UART(COM);

Connect the ground unit UART1 with a UART (TTL) to USB converter to the computer. Before this, please install the driver in the computer.

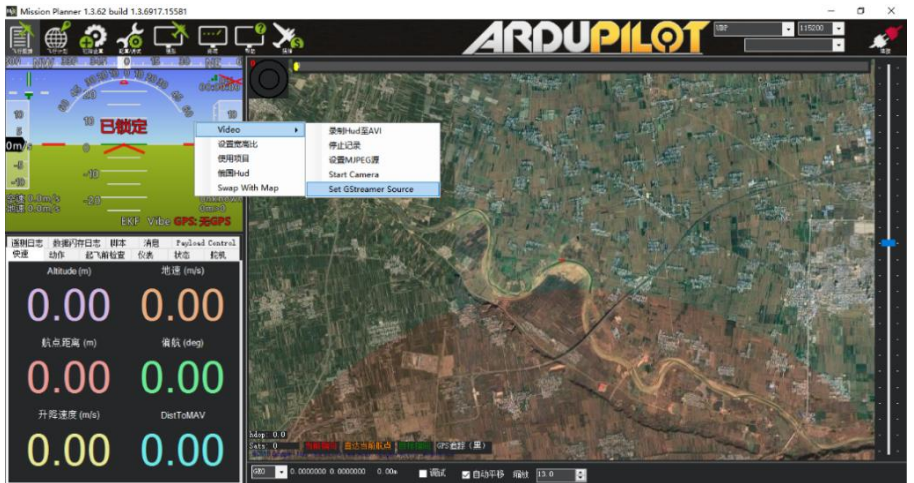




Open Mission Planner, select COM (Please check the COM number) and the right baud rate, click the “connect” button, Mission Planner will get flight data.

## 6. Get video

When you open the Mission Planner, click Video and then Set GStreamer Source, as show below:





Input the address: `rtspsrc location=rtsp://192.168.1.36/stream0 latency=0 ! decodebin ! videoconvert ! video/x-raw,format=BGRA ! appsink name=outsink`

⚠ Attention: The IP **"192.168.1.36/stream0"** is an example of the gimbal, please use your own gimbal RTSP address.

## Improve RC controller distance through SBUS

1. Connect air unit SBUS\_OUT to flight controller RC IN.

Using the SBUS cable in the accessory box to connect the air unit and the flight controller. The cable is 3 pin.

⚠ Attention: The SBUS\_OUT port of air unit is output. The maximum of +5V output current is 1A. If you don't need the +5V, let it open. Do not take it as input. Otherwise, the stability of the system will be affected.

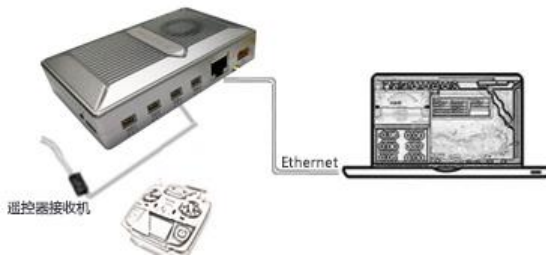


2. Connect the RC receiver to the ground unit

Using the SBUS cable in the accessory box to connect the ground unit to the RC receiver.



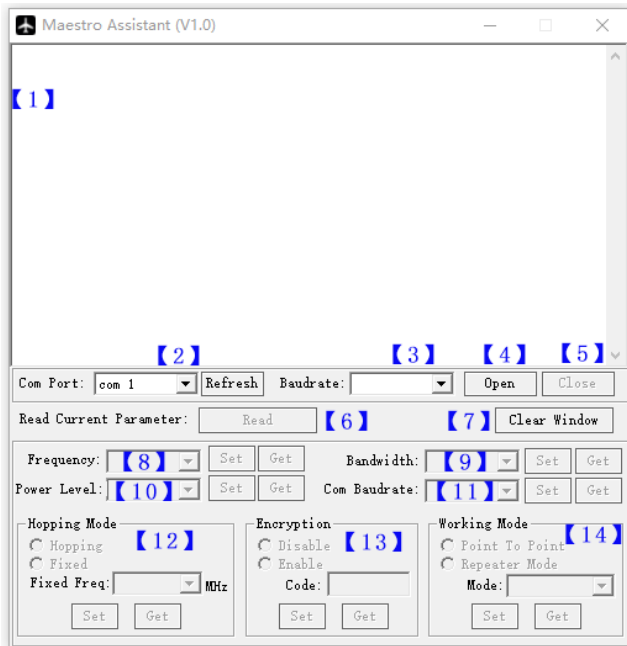
Attention: The SBUS\_IN port of ground unit is input. The maximum of +5V output current is 1A. You can use it to power the RC receiver. Please pay more attention to the cable line order.



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# Maestro Assistant

## Interface of Maestro Assistant



Function description:

- 【1】** Information display: display status information for the M52.
- 【2】** UART(COM) select: Select the right COM number of the computer to connect M52. If you want to change to another COM , please click the 'Refresh' button.
- 【3】** Baud rate select: Select the right baud rate for the COM. Make it the same as M52 UART1.
- 【4】** Open COM button.
- 【5】** Close COM button.

- 
- 【6】 Read current parameter button: click this button to get the current parameter of device.
- 【7】 Clear window button: to clear the information display.
- 【8】 Select frequency: The M52 frequency band has been set. User can't change. You can click 'Get' button to get current frequency band.
- 【9】 Select BW: There are four BW to be selected——3MHz/5MHz/10MHz/20MHz. Choose the BW you needed, and click 'Set' button to complete setup. Click the 'Get' button to get current BW.
- 【10】 Select Power Level: There are three power level to be selected——High/Mid/Low Choose the power level you needed, and click 'Set' button to complete setup. Click the 'Get' button to get current power level.
- 【11】 Select baud rate: You can select the right baud rate for M52 Uart1 in this box. Choose the baud rate you needed, and click 'Set' button to complete setup. Click the 'Get' button to get current baud rate.
- 【12】 Select hopping mode: There are two mode to be selected——Hopping/Fixed. Choose the mode you needed, and click 'Set' button to complete setup. Click the 'Get' button to get mode. When you select Fixed mode, you need to choose a fixed frequency below. The fixed frequency is related to frequency band and BW.
- 【13】 Select Encryption: You can disable/enable the encryption. When enable this function, you can set your private password. The password should in the range of 100000~999999. Devices with different password do not link.
- 【14】 Select Working mode: There are two working mode of M52——Point to Point mode and Repeater mode. Choose the working mode you needed, and click 'Set' button to complete setup. Click the 'Get' button to get current working mode. This function only needs to be set up on the M51 air unit. The ground unit can synchronize automatically. If you select Repeater mode, you need to select the air unit whether it is TX or repeater.

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# How to use Maestro Assistant

## 1. Connect M52 with Maestro Assistant.

Maestro Assistant is a Windows software that configures M52. Before configuration, please connect the UART1 to computer via UART(TTL) to USB converter. Select the right COM and baud rate. Click 'open' button.

## 2. Read current parameter.



After step1, click 'Read' button. All current parameter will print on the information display. Because the Working mode is only for air unit. The Working mode box will turn grey on ground unit configuration.



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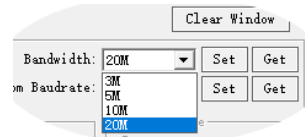
### 3. Configurations

#### 3.1 Frequency Band

The M52 frequency band has been set. User can not change. You can click 'Get' button to get current frequency band.

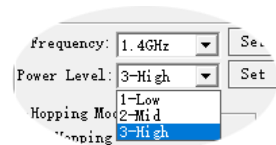
#### 3.2 Bandwidth

There are four BW to be selected——3MHz/5MHz/10MHz/20MHz. The greater the BW, the more data can be transmitted, but the weaker the anti-interference. In Fixed frequency mode, M52 will have more frequency to fix with small BW.



#### 3.3 RF Power

M52 has three levels of power to choose. In order to avoid affecting other devices, please select the appropriate transmission power. The specific RF power values are as follow



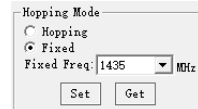
1-Low: 20dBm;

2-Mid: 27dBm;

3-High: 32dBm.

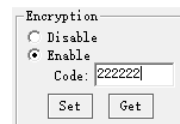
#### 3.4 Hopping/Fixed Mode

There are two mode to be selected——Hopping /Fixed. In Hopping mode, M51 can automatically adjust frequency when there is interference. In fixed mode, the device is fixed to a special frequency . So in one frequency band, up to four sets of devices can be used.



#### 3.5 Encryption

The wireless signal can be encrypted during transmission. When enable this function, you can set your private password.

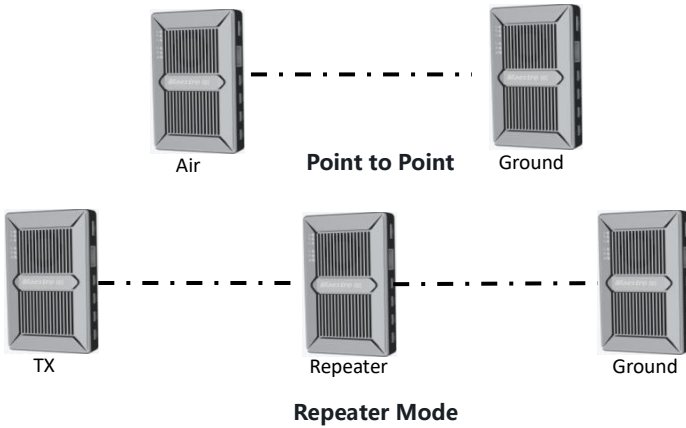
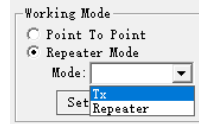


The password should in the range of 100000~999999. Devices with different password do not

link. When disable this function, different M52 air and ground can link each other..

### 3.6 Working Mode

M52 can work in Point to Point Mode and Repeater Mode. Only the air unit of M52 need to be set. The ground unit can synchronize automatically. In Repeater mode, the air unit can be set to TX (transmitter) or Repeater.



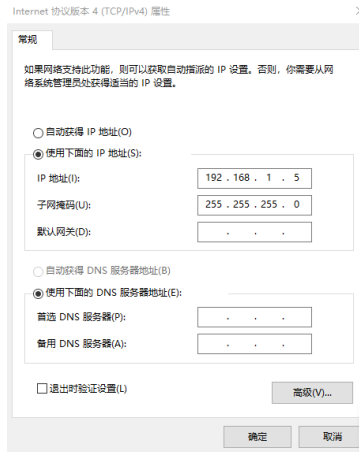
With Repeater mode, M52 can be easily used under NLOS situation. You only need to buy one more air unit and then can establish a repeater system easily.

# M52 Web UI Configuration Description

Parameter of M52 can also be set through web UI. User can enter IP address through the browser to access the web UI. The air unit default IP is 192.168.1.200. The ground is 192.168.1.236. In Repeater mode, TX is 192.168.1.200. Repeater is 192.168.1.201.

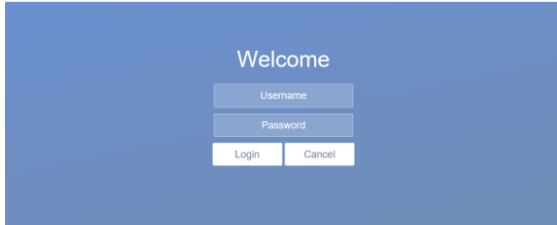
If you change the device to another IP address, please access the web UI through the new IP. If you forget the IP you changed, press the button on the device for 10 seconds when the device is power on to restore to factory settings.

You need to change your computer IP to 192.168.1.X so as to access the device web UI. As shown in the following figure :



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# Login



After you enter IP address in the browser, you will see the 'Welcome' page. Default username is: admin, password is: 123456. Then you can login.

# Settings

**Device setting**    Wireless Parameter setting    System Update    System Operation

## Air setting

Device IP	<input type="text" value="192"/> . <input type="text" value="168"/> . <input type="text" value="1"/> . <input type="text" value="200"/>
Gateway	<input type="text" value="192"/> . <input type="text" value="168"/> . <input type="text" value="1"/> . <input type="text" value="1"/>
Uart1 Baudrate	<input type="text" value="115200"/> ▼
Uart2 Baudrate	<input type="text" value="115200"/> ▼
<input type="button" value="Save"/>	

In Air setting page, user can change air IP 、 Gateway and other parameter. You can refer to the table below.

Parameter	Value	Description
Device IP	Default Air and TX: 192.168.1.200 Repeater: 192.168.1.201 Ground: 192.168.1.236	User can change
Gateway	Default 192.168.1.1	User can change
Uart1 Baudrate	9600/14400/19200 57600/115200/128000	User can change, Default 115200
Uart2 Baudrate	9600/14400/19200 57600/115200/128000 VBR	User can change, Default 115200

If you change the device parameter, it will be in effect after rebooting. If you change IP address, please enter the new address in your browser after rebooting.

# Wireless Parameter setting

## Wireless Parameter setting

Frequency	800M ▾
Bandwidth	20M ▾
Power	High ▾
Hopping Mode	<input checked="" type="radio"/> Hopping <input type="radio"/> Fixed ▾
Encryption	<input checked="" type="radio"/> Disable <input type="radio"/> Enable Code: 000000 (100000-999999)
Working Mode	<input type="radio"/> Point to Point <input type="radio"/> Repeater Mode Repeater ▾
<input type="button" value="Save"/>	

User can change wireless parameter on Wireless Parameter setting page . You can refer to the table below.

Parameter	Value	Description
Frequency	800M/1.4G	User can query
Bandwidth	3/5/10/20M	Optional
Power	High/Middle/low	Optional
Hopping Mode	Hopping/Fixed	Optional
Encryption	Disable/Enable	Optional
Working Mode	Point to Point Repeater Mode	Only the air unit of M52 need to be set. The ground unit can synchronize automatically

Web UI configuration is the same as Maestro Assistant. User can check it in 'How to use Maestro Assistant' part 3 for more details.

When you configure parameter through Web UI, It will be in effect after rebooting

## System Update

Device setting    Wireless Parameter setting    **System Update**    System Operation

### System Update

Current Version	
Firmware Version	M104A_V1.0.4
Update	
Select file:	<input type="text" value="浏览..."/>
<input type="button" value="Send"/>	

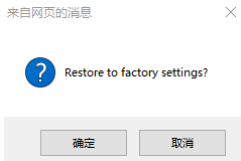
User can update FW version in System Update page. Before update, please download the latest software version from our website.

# System Operation

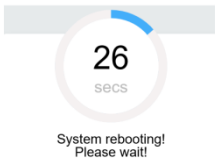
## System Operations



User can Restore and Reboot on System Operation page. While 'Restore' is to restore all parameter to factory settings.



"Reboot" is used for system rebooting.



If user do not change the device IP address, it will go to the Login page after rebooting. If you change the IP address, you need to enter the new IP address in your browser after rebooting.



# Specification

Category	Item	Detail	
<b>Wireless Performance</b>	Frequency band	800MHz/1.4GHz	
	Frequency range	800MHz: 806MHz~825MHz 1.4GHz: 1427MHz~1447MHz	
	Band width	3MHz/5MHz/10MHz/20MHz	
	Modulation	OFDM	
	EIRP	32dBm±1dB	
	Sensitivity	≤-92dBm	
	Range	34km <sup>*1</sup>	
	Bit rate	30Mbps@20MHz	
<b>Power Range</b>	DC 9~28V		
<b>Power consumption</b>	≤8.5W		
<b>Interface</b>	Antenna	SMA *2	
	Power	XT30	
	UART	TTL 3.3V, 1 start bit, 8 data bit, 1 stop bit, no parity., Baud rate 115200 (default) , 57600, 38400, 19200, 9600	
		UART1 and UART2	
	SBUS	SBUS_IN	
		SBUS_OUT	
	Ethernet	RJ45	
		4Pin	
		7Pin (With +12V Output)	
	Button	1	
Switch	For air and ground switch		

<b>Antenna</b>	Interface	SMA
	Type	Air: Glue stick antenna 20cm Ground: Fiber glass antenna, 120cm
	Polarization type	Vertical
	Gain	Air: 2.5dBi Ground: 10dBi
	SWR	≤2.0
<b>Environment</b>	Work temperature	-40°C ~ +70°C
	Storage temperature	-40°C ~ +85°C
	Humidity	5~95%, non-condensing
<b>Appearance</b>	Size	112 X 63.5 X 19 mm
	weight	143g

\*1 The distance is tested under the condition of no interference and LOS.

Note: The explanation right of the above product specification belongs to Shenzhen Mainlink Aero communication Technology Co., LTD.

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# FAQ

1	<b>Description</b>	The power indicator light is not on after powering up
Solutions:		
<ol style="list-style-type: none"><li>1. Check the wiring order of the power cable.</li><li>2. Check the DC power range.</li></ol>		
2	<b>Description</b>	Link indicator light is not on after powering up.
Solutions:		
<ol style="list-style-type: none"><li>1. Check that the RF cable is connected properly.</li><li>2. Check that the BW shortcut keys of the air and ground are in the same position.</li><li>3. Check the antenna is OK.</li></ol>		
3	<b>Description</b>	The link indicator light is OK. But no data output.
Solutions:		
<ol style="list-style-type: none"><li>1. Check the UART cable wiring order.</li><li>2. Check the UART baud rate.</li><li>3. Please contact our company's after-sales service.</li></ol>		
4	<b>Description</b>	The ground unit can't output RTSP video streaming.
Solutions:		
<ol style="list-style-type: none"><li>1. Check the cable connection and wireless link is OK.</li><li>2. Check the IP address of computer is right.</li><li>3. Check the RTSP server address is correct.</li><li>4. Please contact our company's after-sales service.</li></ol>		

Note: For more information, please check out our official video tutorial. Foreign users please check You Tube .

If you have any questions about this document, please contact

Mainlink by sending a message to [support@mainlinkaero.com](mailto:support@mainlinkaero.com).

You can also visit [www.mainlinkaero.com](http://www.mainlinkaero.com)

